SAND2012-3285P

Sandia National Laboratories

Exemption Request Use for One Time Processing of Radioactive Materials

U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Initial Conditions

- 30 Legacy Contact Handled TRU Waste Drums from the closure of laboratories at Lovelace Respiratory Research Institute (LRRI)

- Contents of the drums include high activity alpha-emitting radionuclides (e.g., Pu-238 and Cm-244) in highly respirable form, excess chemicals (both flammable and non-flammable), excess lab equipment, sharps, and decontamination materials

- Drums were to be prepared at an existing Nuclear Hazard Category 3 facility for shipping to the Waste Isolation Pilot Plant (WIPP). No intrusive activities were expected.

Complications

- Real time radiography of the drums identified three drums (2 that exceed HC-3 limits and 1 less than HC-3) with enclosed liquids

- Visual inspection identified three additional drums (all of which exceed HC-3 limits) would require vents replaced with WIPP approved filtered vents

- These six drums would require intrusive processing with an estimated duration of less than 3 weeks to complete

Complications

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- The highly respirable form of the radionuclides indicated that primary (glovebox and glovebox exhaust) and secondary confinement would be needed
- Possibility of flammable gases inside waste drums
- The presence of sharps within the drums would require some planning to prevent an injection type event from occurring and require some preplanning to ensure the worker would be properly treated if an injection type event did occur

Proposed Solutions and Risks

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- **Do Nothing** – Return drums to long term storage at Sandia (estimated to exceed 10 years before shipping to WIPP).
- **Process in Existing Nuclear Facility** – None of the existing nuclear facilities have desired confinement/filtration system for the possible form of the material. Would require modifications that may be considered Major Modifications.
- **Process in Radiological Facility with Appropriate Relief from 10 CFR 830, Subpart B Requirements** – An existing glovebox for waste processing could be used but would require modification.
- **Ship to another DOE Site** – Drums could not be shipped without being processed, due to legal ramifications with the State of New Mexico.

Path Forward

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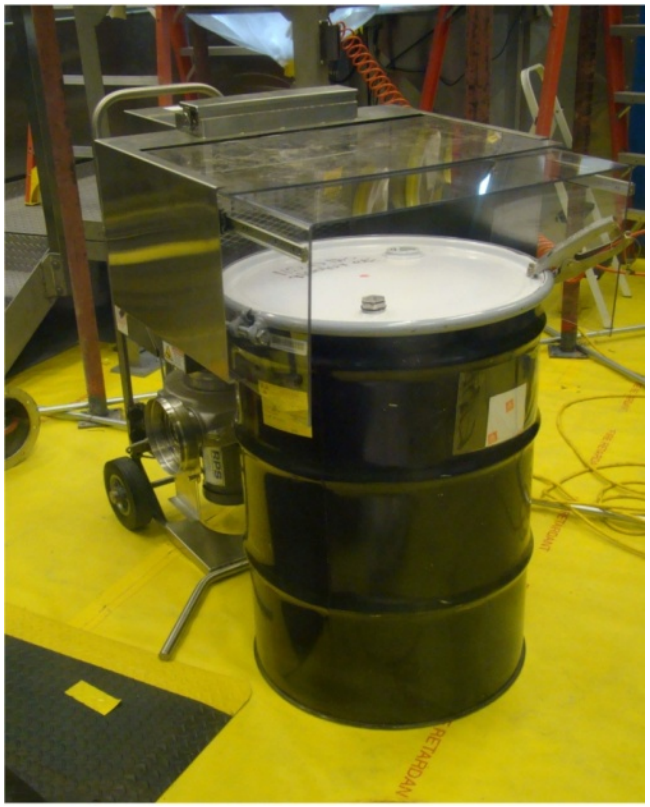
- The proposed solution chosen is to process the drums in an existing radiological facility (Radioactive Material and Mixed Waste Management Facility (RMWMF)) within an existing glovebox, modified to enhance confinement/filtration
- RMWMF personnel are experienced at processing less than HC-3 radioactive materials in a glovebox
- This glovebox is within a secondary confinement boundary that will help minimize potential building contamination
- The existing glovebox is an air box (i.e., not inerted)

Pre Modification Glovebox

Drum Vent Hood



Path Forward (continued)

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- HC-3 Transportation Safety Basis Supplement
- 10 CFR 830 exemption request
- Stand-alone Hazard Analysis
- Glovebox and Glovebox exhaust modifications
- Update the Fire Hazard Analysis
- Revise the Emergency Plan
- Primary Hazard Screening
- Technical Work Document – Includes Industrial Hygiene, Fire Protection, and Radiation Protection concerns
- Low Hazards Operations Checklist
- Independent Verification and Validation

Changes to the Safety Basis

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To support this activity the following safety basis changes, requiring DOE approval, were processed:

- A revision to the HC-3 Transportation Safety Basis was required to add the allowable route for the drums from their storage location to the a new location (RMWMF) for processing

- An exemption to 10 CFR 830, Subpart B, to allow the RMWMF to process the five drums that exceed HC-3 quantities in a radiological facility

Stand-alone Hazard Analysis

- A Hazards Analysis Team performed an analysis of the proposed activities. DOE-STD-5506-2007, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities* was used as a reference to ensure applicable hazards were analyzed

- Hazard analysis team included Operations and Support personnel from RMWMF, fire protection, industrial hygiene, radiation protection, safety basis, and management

Stand-alone Hazard Analysis (Cont.)

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- Systematic evaluation of hazards specific to the one-time processing of the LRRI waste
- Resulted in a list of controls that were all implemented for the proposed activity
- Served as the required hazard analysis for the Primary Hazard Screen

Glovebox Modifications

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- To minimize the contamination probability a glovebox modification was undertaken to install a disposable in-box HEPA filter and change the exhaust ductwork between the glovebox and the first facility HEPA filter to welded ducts.
- Provide isolation capability of exhaust flows between the gloveboxes
- Rebalance the building to increase negative pressure within the glovebox
- Increase exhaust flow in the event of a loss of a drum port

Glovebox Modifications

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- The presence of sharps within the drums to be sorted required some type of hand/arm protection for the worker
- Discussions were held with other facilities that did similar glovebox work to determine what type of protection was available and still provided the required dexterity
- The use of hex armor gloves worn over the glovebox gloves provided the best safety and dexterity combination

Technical Work Document

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- A Technical Work Document (TWD) was developed for the proposed activity.
- The TWD provided workers with the procedural direction to complete the activity
- The TWD included implementation of controls specified in the Stand-alone Hazard Analysis, the DOE SER for the HC-3 Transportation Activity, the Conditions of Approval specified in the Approval of the 10 CFR 830 exemption request, and additional controls identified by the technical disciplines (e.g., fire protection, industrial hygiene, radiation protection)

Revise the Emergency Plan

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- The response to a puncture type event was examined by the personnel on the project and changes to the event response were developed
- Lessons learned from the Savannah River Site Pu puncture wound were reviewed
- Emergency Management and SNL medical prepared for a medical emergency involving inhalation/injection of 238Pu and 244Cm

Primary Hazard Screening (PHS)

The PHS is an initial step of the SNL Integrated Safety Management Process

- The PHS assists users in identifying the:
  - Bounding work scope for an activity/operation/facility
  - Primary Environment, Safety, and Health (ES&H) hazards
  - ES&H requirements for those hazards
  - Safety Basis classification for the activity/operation/facility
- The LRRI Operation was classified as a Low Hazard Industrial Facility with additional “radiological” designation
- The required safety basis documentation for this operation was a PHS with a Stand-alone Hazard Analysis.

New Activity Checklist

- RMWMF Line Management verified that the facility had achieved readiness to start LRRI drum processing operations through a Low Hazards Operations Checklist.

- This checklist was modified to include prerequisites and attributes unique to the LRRI operation

Independent Verification and Validation

- An Independent Verification and Validation (IVV) was performed following line management's completion of the checklist and declaration that readiness had been achieved.

- The IVV focused on the specific activities unique to LRRI drum processing and the activity specific training, equipment, and procedures to support LRRI drum processing.

- The IVV reviewed structures, systems, and components, training, and procedures related to LRRI drum staging and processing, radiological counting, drum movement between buildings, and receiving/shipping.

Independent Verification and Validation (Continued)

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- As issues were identified during the IVV review, the issues and potential solutions were discussed in detail with RMWMF management and staff. Identified issues were resolved by the RMWMF line organization. The IVV Team confirmed issue resolution was adequate and supported safe conduct of the planned LRRI drum processing activities. There were no open issues at the conclusion of the IVV review.

Process Drums

- The first drum processed was the drum containing liquids with less than HC-3 quantities of material
- WIPP approved drum vents were installed on all associated drums
- The two drums containing liquid were processed and the liquid stabilized or removed as applicable

Project Execution

- June 24, 2011, VP formally requested from SSO authorization to begin LRRI drum repacking
- Week of June 27th, 2011 received authorization from SSO to begin operations
- Week of June 27th, 2011 process Less Than Hazard Category 3 (HC-3) drum in the glove box
- Week July 5th, 2011 transfer the five drums from the Manzano Storage Bunkers and began processing HC-3 drums

Project Execution

- Week of July 11th, 2011 complete repackaging and filter replacement
- Week of July 18th, 2011 Real Time Radiography and gamma spectroscopy
- Upon completion of work activities, including shipping the drums to an approved HC-3 facility, the 10 CFR 830 exemption expired and the facility returned to its normal operations
- August 2011 ship the TRU Waste to Idaho National Laboratories for final certification for disposal at WIPP

Benefits

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- The benefits realized during this activity were primarily based on the time and money saved as a result of the 10 CFR 830 exemption

- Without this exemption the entire process of starting a new nuclear facility was not required to support an activity with a duration less than 3 weeks

Benefits (Continued)

- The benefits of the IVV approach seen in the LRRI IVV review included:
  - Real-time resolution of issues at a deeper level of detail allowed a collaboration among facility management, operations and operations support personnel, and the review team.
  - By conducting issue resolution in a collaborative fashion, the range of solutions considered was more effective as the parties communicated and refined the issues and solutions.
  - Issues were discussed in much greater detail and depth, which resulted in better understanding and a more meaningful set of resolution actions, and took much less time.
  - The approach encouraged the operations personnel to be engaged throughout the process, from refining the issue to be resolved, through implementation of the mutually agreed resolution.

Team Effort

- The successful completion of this proposed activity was a team effort.

- The team consisted of the Employees doing the work (at RMWMF and moving the drums), the technical disciplines (fire protection, industrial hygiene, radiation protection, safety basis, and safety engineering), Sandia Management, and regulatory oversite (DOE) working together to safely complete the project